

# Study towards Adoption of Research Data Management Services in Zanzibar Academic Libraries

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## Abstract

The aim of this paper is to study the mechanism towards adoption of research data management in Zanzibar academic libraries. The study used a cross-sectional design whereby qualitative and quantitative methods were used to collect data. Survey-based questionnaires were used to collect quantitative data and interviews were undertaken to collect qualitative data. Forty (40) information professionals and twelve (12) IT technicians were selected through non-probability sampling technique under purposive random sampling from a population of 45 librarians and 16 IT technicians from five higher learning institutions in Zanzibar namely the Institute of Public Administration, Mwalimu Nyerere Memorial Academy – Karume Campus, State University of Zanzibar, Sumait University and Zanzibar University. The response rate was 45 (74%). The findings show that ICT services and infrastructure in most of the universities were good, however, many universities face common challenge of low internet bandwidth. This may reduce the effectiveness of research data access among researchers. Findings also show that some academic libraries have started to manage research outputs through institutional repositories; however, none of them implemented research data management. Findings also show the existence of NICTNBB, ZICTIA, COTUL, TERNET and COSTECH can be taken as an opportunity for establishing a national wide dataset. Likewise, the majority of information professionals have limited knowledge about research data management and this was a major challenge facing academic librarians. The study recommends establishing a national discussion on research data management, creating awareness and developing strategies and guidelines on research data management and sharing in academic libraries in Zanzibar -Tanzania.

**Keywords:** *research data management, higher learning intuitions, academic libraries, Zanzibar, Tanzania*

## 1. Introduction

Today, the Research Data Management (RDM) and sharing agenda is increasingly discussed in the field of research and information science. However, according to Tenopir et al. (2014), the subject of research data management is still new to many information professionals and researchers in Africa. Despite that, researchers from different disciplines have varying opinions and perceptions towards RDM. Several scholars have attempted to provide a useful definition of RDM. For example, Whyte and Tedds (2011) define research data management as an organization of data, from its entry to the research cycle through the dissemination and archiving of valuable results. Similarly, Eindhoven University of Technology (2020) defines RDM as the careful handling and organization of research data during the entire research cycle, with the aim of making the research process as efficient as possible and to facilitate cooperation with others. More specifically, RDM helps to protect

data, it facilitates in sharing the data with others and it ensures that research data is findable, accessible and (re) usable.

Furthermore, the Organization for Economic Co-operation and Development (2007) defines research data as factual records (numerical scores, textual records, images and sounds) used as primary sources for scientific research, and that are commonly accepted in the scientific community as necessary to validate research findings. Here, data could be physical records of computer files created by researchers or big data shared on servers. Regarding the format of research data, Borgman (2012) states that data produced as part of research takes a wide range of forms, from statics and experimental results to discussion and interview records and questionnaire scripts. Research data management consists of a number of different activities and process associated with the data lifecycle, involving the design and creation of data, storage, security, preservation, retrieval, sharing and reuse, all these activities taking into account technical capabilities, ethical and legal issue and government framework (Cox & Pinfield, 2014). Research data management involves the management of data via infrastructures, the long-term storage and security of data, and open access, but also communication between researchers and different fields of study (Schopfel, et al. 2014).

The discussion on RDM, according to Childs et al. (2014), is mainly associated with the need to introduce it and how can be sustained. The discussion also, based on the agenda of openness, which insists more sharing of scholarly content, including research data, to allow it to be accessed by other researchers so as to ensure research integrity. In this regard, it can be concluded that the effective management of research data has a number of significances as elaborated by Bloom (2013) that RDM can be reused by other researchers and applied in various contexts. The data collectors and analysts also get credit and acknowledgement through data citation. Data sharing brings transparency in the research process and data collection methods. It also saves a lot of time of the researchers, so they can focus on newer avenues of research instead of collecting data from scratch. In addition, it can help to optimize research outputs, increase the impact of research, and support open scientific inquiry. Economically, according to Patel (2016), RDM leads to an intensification of the need for research funders to justify how the public money they give to research is spent. Based on this significance, it is anticipated that management of research data, sooner, is going to become indispensable in the field of research as well as information sciences. However, the issues related to research data management are varied and complex and may require technical and legal expertise. Therefore, it is imperative that research institutions and universities start evolving mechanisms to manage and share research datasets.

There is a positive story about research sharing in Tanzania, whereby several efforts have been taken to enhance research sharing activities in the country. For example, the study of Dulle (2010) observes that the majority of researchers in Tanzania are willing to share their research in open access journals. The study of Mgonzo & Yonah (2014) states that there is a number of universities established digital open access institutional repositories aimed at freely sharing of their research and intellectual outputs. Similarly, the Tanzania Commission for Science and Technology (COSTECH) (2019) has established a one stop

database for all Tanzania institutional repositories to facilitate the accessibility of scientific output produced in the country. However, Yonah (2014) observes that types of content shared in those repositories are journal articles, unpublished theses, references and learning objects, but not research datasets. Based on these facts, one may conclude that the research datasets sharing in Tanzania is not yet practiced or it is at infancy stage.

The subject of data management has attracted attention to researchers and information professionals. However, literatures show that so far many universities and higher learning institutions have concentrated much on open access as a means of improving visibility and sharing research outputs emanating from their respective institutions. Several research which focus on open access and research sharing in academic libraries, for example (Garritano & Carlson, 2009; Newton, Miller, & Bracke, 2010; Brewerton, 2012; Auckland, 2012) observe that institutional repositories are becoming major components of the technical infrastructure of research sharing among higher learning institutions in Africa. Referring to Tanzania, for example, the studies of Dulle (2010), Lwoga & Questier (2014) and Mgonzo & Yonah (2014) found that there has been a high uptake of institutional repositories by universities in Tanzania and researchers willing to share their research openly. Despite this fact, however, most of the previous studies have focused on the adoption and usage of open access repositories rather than research data preservation and sharing. Therefore, the topic of open data repositories or research data management has not been well examined in Tanzania and research data appears not to be published by any university repository. Consequently, lack of research data sharing may lead to duplication of researchers' efforts and misallocation of national research funds. This study, therefore, intends to examine the mechanism towards adoption of research data management in academic libraries in Tanzania islands (Zanzibar). The main objective of this study is to study the mechanism towards adoption of research data management services in academic libraries in Zanzibar. Specifically, this study needs to:

1. Examine the knowledge and awareness of information professionals in research data management services
2. Assess the institutional strategies and initiatives in place towards provision of research data management in Zanzibar academic libraries
3. Identify the available opportunities for research data management implementation in Zanzibar academic libraries
4. Examine the challenges towards adoption of research data management in academic libraries in Zanzibar

Research questions include:

1. What is the knowledge and awareness level of information professionals in research data management?
2. What are the institutional strategies and initiatives in place for provision of research data management services in Zanzibar academic libraries?
3. Which opportunities are available for research data management implementation in Zanzibar academic libraries?

#### 4. What are the challenges facing academic libraries in Zanzibar in the adoption of research data management?

The study covers a very small area of Tanzania and uses cross-sectional study to only five academic libraries in Zanzibar and involves a small sample size, skewed weighting towards information professionals working with libraries. Also, it partially discusses several aspects of RDM leaving some of them undiscussed. Therefore, the results may not be generally applicable to all aspects of RDM, academic libraries and other RDM stakeholders in Tanzania.

## 2. Literature Review

### *2.1 The Global Overview of Research Data Management*

Research cannot happen and would be not completed in any area of study without authentic and objective data (Patel, 2016). In this regard, a group of scientists in the United Kingdom in 2009 proposed that for science to effectively function and for the society to harvest the full benefits from scientific endeavours, it is crucial that science research data be made open (Pryor & Whyte, 2013). The period from 2000 has evidenced an explosion in the drivers of data sharing to the extent that nowadays, according to Corti, et al. (2014), some research funders, publishers and research institutions are increasingly encouraging easy/ or open access to research data and data plans to ensure maximum quality, sustainability, accessibility and openness of research data. The survey of Corral et al. (2013) in UK, Australian, New Zealand and Ireland, which had 88 institutions is very significant. Corral et al. (ibid) observe that some of UK libraries currently offering RDM support through assistance with technology infrastructure and tools. This is the fact that, as the need for research data management grows, academic libraries around the globe should consider adding data services to help with the research mission of their institution.

### *2.2 The Experience of Researchers and Information Professionals in Research Data Management*

Today, researchers' responsibilities towards their research data are changing across all domains of scientific endeavour. Corti et al. (2014) emphasize that researchers and information professionals need to improve, enhance and professionalize their research data management skills to meet the challenge of producing the highest quality research outputs in an efficient and responsible way, with the ability to share and reuse such outputs. The research data management services in an increasingly familiar unit within university libraries, providing a range of services to support researchers who are creating, managing and sharing their research. Several commentators, for example, Alvaro et al., as cited by Cox & Pinfield (2014), have proposed that academic library services are in good position to play an important role in research data management. This is very true since there is a potential connection between research data management and the open-access agenda that libraries have been so active in promoting it. However, the agenda of RDM may not be necessary in open access.

There is a wide range of skills required for research data management, and where the

librarians are very strong in cataloguing including metadata, classification, research engagement, digital preservation, training, copyright issues, and publication process. In this regard, a number of researchers have argued convincingly for the need for library services to foreground the RDM agenda. Lewis (2010) and further Corral (2012), for example, propose a pyramid model of nine areas of RDM activity for librarians. At the peak of the pyramid is influencing national policy; at the next level, leading on institutional policy, developing local curation capacity and working with Library and Information Science schools to identify required skills; and at the third stage, developing information professional's workforce confidence with data, training to researchers including undergraduate and postgraduate students, and advice services and data awareness raising among researchers.

Similarly, Lyon (2012) sketches potential roles of the library to a research lifecycle model in ten stages, whereas at some points tried to identifying potential partner services, they include: first, RDM requirements gathering; second, RDM planning – advocacy and guidance to researchers at all levels; third, RDM informatics – technical advice on data formats and metadata; fourth, research data citation; fifth, RDM training to researchers; sixth, research data licensing; seventh, research data appraisal – guidance on which data to keep; eighth, research data storage (with IT services); ninth, research data access; and finally, research data impact (with research support offices).

However, apart from these new RDM skills, Auckland (2012) emphasizes various traditional ways in which librarians could have a role in supporting research and data management, for example: information literacy and reference management trainings, offering advice on funding sources, advice on copyright issues, advice on archiving of research data, open access and institutional repository, and supporting roles in conducting literature reviews or current awareness alert. On another part, Rice & Southall (2016) call academic librarians as data librarians to mean that they could be involved in working within library systems, managing data and developing good working relationships with researchers. However, apart from all of these library technical skills, the study of Cox & Pinfield (2014) observed that over 50% of the respondents said the library staff did not have the capacity and adequate RDM skills.

### ***2.3 Mechanism for Effective Preservation and Sharing of Research Data in Academic Libraries***

There is a research principle which says that good research needs good plans. Recognizing this fact, Wolski & Richardson (2011) note that at present, many major research funders globally either have currently developed or are implementing policies that require grant holders to submit data management plans for formal approval and to manage their data in accordance with those plans. Recently, publishers as well as the research society have started to realize the importance of sharing raw research data along with the manuscript. Referring to Indian universities Patel (2016) stresses that universities now mandate at least a few publications from scholars pursuing doctoral studies before the degree is awarded. Such observation has also been expressed by RCUK (2012) as cited in Cox and Pinfield (2014) that in United Kingdom, many major research funders now mandate the applicants to produce a data management plan as part of their research proposal and this is expected

to design-in data sharing and reuse whether possible.

In January 2011, the National Science Foundation (NSF) began requiring researchers to include a detailed data management plan as part of each funding proposal. NSF guidelines state the proposal structure and the required information that should be included, that are: information about the types of data to be gathered during the research, the metadata standards to be used, data reusability policies and provisions, and finally, plans for long-term data archiving (NFS, 2012). This is where libraries and librarian's role and contribution might be called for. Libraries and librarians can be actively involved in providing an infrastructure of research data tools and services (Tenopir, Birch & Allard, 2012). Libraries also have expertise in information organisation, metadata standards and application, and providing access to information (Antell et al 2014). Similarly, Brochu & Burns (2019) argue that librarians are a key component in RDM. They consider them as educators because of their role in data discovery, re-use, collection, and management so they can help researchers to understand the best way to conduct research.

Larsen and Riis (2012) and Vaughan et al. (2013) assert that libraries might be involved in research through the whole process of conducting research from ideas generation and conception, data collection, manipulation and interpretation, storage and data preservation, publication of findings, and assessment of impact. They may also provide supports to researchers through facilitating access to a collection of sources and then helping and training people to use it, making it an informal partner in the research (Corrall, 2014; O'Brien & Richardson, 2015). Apart from their significant role, there might be some barriers and challenges for libraries to provide research data services that make libraries cooperation in the research field not fully exploited. Among these barriers is data sharing, as researchers might not be willing to share their data. One reason for this might be the documentation process of data that is labor intensive and time consuming. Another reason according to Borgman (2012) is the lack of interest as the reward of the research comes from its publication and not from its data management process.

#### ***2.4 The Challenges Facing National Research Institutions and Academic Libraries in Managing their Research Datasets***

A report on an international study of RDM activities, services and capabilities in higher education libraries in Australia, Canada, Germany, Ireland, the Netherlands, New Zealand and the UK as cited in Cox et al. (2017) indicates that libraries have provided some RDM services, particularly in advocacy and policy development. The same report, however, shows some challenges that libraries are facing: lack of skills; limited resources; and absence of collaboration with other support services and getting acceptance from researchers and university management. Lack of sufficient resources and expertise is another challenge facing RDM in Africa. Knight (2015) Emerald Group Publishing Limited. Purpose \u2013 The purpose of this paper is to present a case study of work performed at the London School of Hygiene and Tropical Medicine to set-up a Research Data Management Service and tailor it to the needs of health researchers. Design/methodology/approach \u2013 The paper describes the motivations for establishing the RDM Service and outlines the three objectives that were set to improve data management practice within the institution. Each of the objectives are explored in turn, stating how they were addressed. Findings \u2013

A university with limited resources can operate a RDM Service that pro-actively supports researchers wishing to manage research data by monitoring evolving support needs, identifying common trends and developing resources that will reduce the time investment needed. The institution-wide survey identified a need for guidance on developing data documentation and archiving research data following project completion. Analysis of ongoing support requests identifies a need for guidance on data management plans and complying with journal sharing requirements. Research limitations/implications \u2013 The paper provides a case study of a single institution. The results may not be generally applicable to universities that support other disciplines. Practical implications \u2013 The case study may be helpful in helping other universities to establish an RDM Service using limited resources. Originality/value \u2013 The paper outlines how the evolving data management needs of public health researchers can be identified and a strategy that can be adopted by an RDM Service to efficiently address these requirements.”, “author” : [ { “dropping-particle” : “”, “family” : “Knight”, “given” : “Gareth”, “non-dropping-particle” : “”, “parse-names” : false, “suffix” : “” } ], “container-title” : “Program”, “id” : “ITEM-1”, “issue” : “4”, “issued” : { “date-parts” : [ [ “2015” ] ] }, “page” : “424-439”, “title” : “Building a research data management service for the London school of hygiene & tropical medicine”, “type” : “article-journal”, “volume” : “49” }, “uris” : [ “http://www.mendeley.com/documents/?uuid=aab9ac70-52f2-4bac-a04d-ad2760c6df7d” ] } ], “mendeley” : { “formattedCitation” : “(Knight, 2015 notes that although there was a recognition that a central service should be available to assist researchers manage their data, the RDM services did not possess sufficient resources and expertise to take a proactive role at a time. Regarding the economic challenge of RDM, Blue Ribbon Task Force (2010) observed that the key questions in research data repository development include financial cost to manage data and who will pay for it.

Similarly, the study of Patel (2016) addresses the following challenges regarding RDM: copyright and data licensing issues, erroneous interpretation of data, data security, data privacy and researcher’s mindset. Patel emphasizes that the most difficult challenge is to convince the researchers to accept the idea of their data being made available for re-use. The information technology skills required for RDM may also be significant. Carlos and Garritano (2010) emphasize that librarians may not currently have IT technical knowledge, may lack domain-specific expertise and may also have limited personal experience of research, all of which may make it difficult for them to position themselves as key players in this area. In the study of Corral et al. (2013), 52 respondents answered the question on the major challenges for librarians with RDM, the most common answers were connected with the issues of skills gaps (20) and lack of confidence (20).

Furthermore, the same source explains that some fields are well advanced in their understanding of the issues (such as health science and engineering) while for other may not yet be an issue (for instance, some humanities scholarship). Concurring with this, Corral (2014) observes that outside the Faculty of Science and Technology, there is yet relatively little awareness of RDM and what it might involve. Another challenge noted by Cox & Pinfield (2014) is lack of collaboration between library and other parts of institution, this includes encouraging others to recognize RDM as a priority, working with other professional services, supporting the wide range of data management practices across

different disciplines and getting the library to be taken seriously.

### 3. Methodology

The study was carried out in Zanzibar and involved five Higher Learning Institutions including the Institute of Public Administration (IPA), Mwalimu Nyerere Memorial Academy – Karume Campus (MNMA), State University of Zanzibar (SUZA), Sumait University (SU), and Zanzibar University (ZU). This study was organized under cross-sectional study whereby mixed approach method was designed to elicit detailed information to address research questions. Questionnaire based- survey was a main instrument and supplemented by a series of face-to-face interview with library and information professionals from the selected academic libraries. The population was composed of 45 university library staff and 16 IT technicians. This makes a total of 61.

A self-administered questionnaire was distributed to all 61 respondents selected through purposive sampling technique. The survey questionnaire was made available online using Google form application. Invitations to participate in the survey were sent to respondents through emails and WhatsApp messages. Prior to release, the questionnaire had been piloted by five academic librarians. Piloting confirmed that the questionnaire took between 15 and 20 minutes to complete, depending on the extent to which free-text comments were added. Changes were made to the questionnaire in response to their comments before its general circulation. Qualitative data were collected through an in-depth interview held with 5 head of libraries, 1 from each academic library and 5 IT technicians, one from each institution. Before analyzing the questionnaire, an assessment was made of the number of responses received and a message was sent to all respondents which had not yet submitted a response by that time requesting that they consider doing so. This prompted further responses before the survey was closed. Finally, the responses were obtained from 35 librarians and 10 IT technicians. The total number of all respondents therefore, was 45 with an overall response rate of 74.5% as Table 1 illustrates:

**Table 1:** *Distribution of Study Population and Questionnaire Responses by Category of Respondent*

Institutions	Study population		Total
	Librarians	IT Technicians	
SUZA	25	6	30
MNMA	4	3	7
SU	4	3	7
ZU	7	4	9
IPA	5	3	8
Total of study population	45	16	61
Respondents targeted	40	12	52
Total response	35	10	45
% of response	87	62	74.5

Source: *Field Data, 2021*



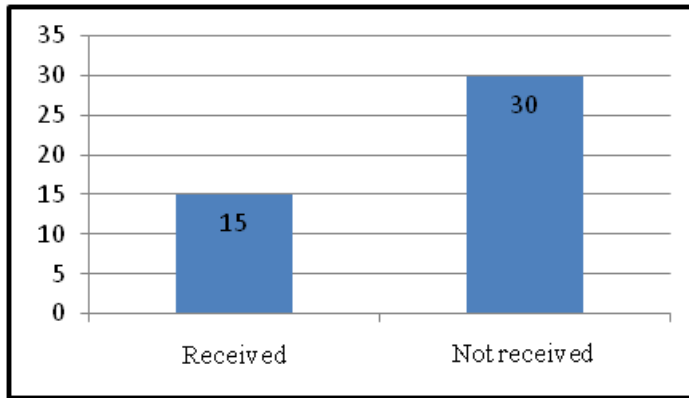
After collection, the data were edited by means of checking and adjusting errors in order to ensure completeness and consistency before analysis. As mentioned before, data in this study came from two sources, thus, interview responses were noted and data coding for survey instrument was done via online software tool and captured in Microsoft Excel file for analysis. Frequencies and percentages were calculated to assess the degree of respondents' rating with questionnaire items in order to assess their awareness, and knowledge on RDM. Also, to assess the available opportunities, the existing strategies and initiatives and finally to assess the challenges that academic libraries might face in the adoption of RDM services.

## **4. Discussion of Findings**

### ***4.1 Awareness and Knowledge of Information Professionals in Research Data Management***

In order to adopt and sustainably maintain any new library service, staff require awareness, knowledge, skills and clear understanding of the new concepts. Thus, the first question in the questionnaire focused on finding out respondents' familiarity with RDM services. Respondents were asked to rate their familiarity from excellent and not familiar. Respondents' general comments with respect to RDM provided some insights regarding their knowledge and skills about RDM services. As indicated in Figure 2, less than a quarter (8:17.7%) of respondents rated average familiar with RDM services. This number includes 5 library staff and 3 IT technicians. In normal situation, all information professionals were expected to be familiar with the trend of RDM services. However, the findings show that more than a half of respondents (25:55.5%) were not familiar with RDM services; followed by (12:26.6%) of respondents who scored less than average awareness of RDM services.

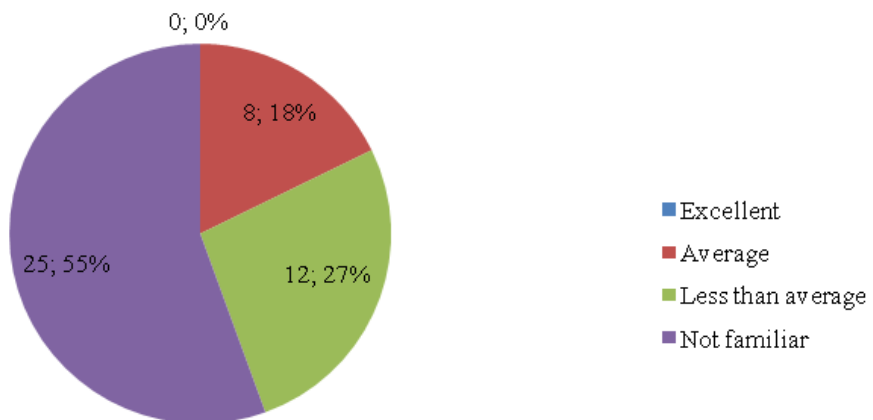
The data imply that the level of awareness of RDM services among the majority of both library staff and IT technicians was likely to be low. Furthermore, data from interview indicated that those who were aware of research data management were confusing between RDM and research report preservation and sharing though institutional repositories. This implies that there is an urgent need to increase awareness on RDM-related skills among librarians. Similar findings were also reported by Tenopir et al. (2014) on RDM awareness and presented the lack of knowledge and skills among librarians and their confidence in the expected roles in RDM services as one of the major challenges. Furthermore, respondents were asked to indicate if they have received any training regarding RDM services. Figure 1 summarizes respondents' answers.



**Figure 1:** *Training on RDM*

**Source:** *Field Data, 2021*

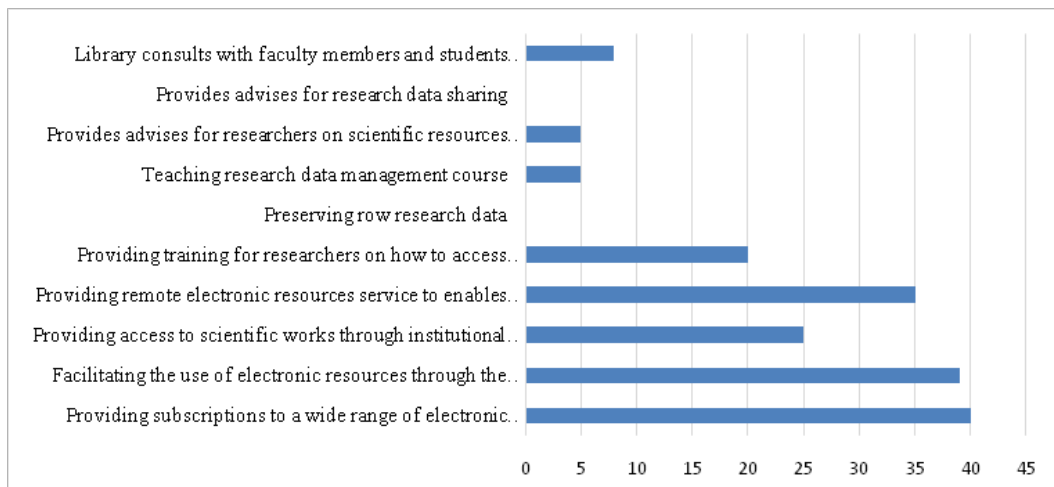
It was noted from Figure 1 that more than a half (30: 66.6%) of the respondents have not received any special training regarding RDM. This was followed by (15:33.4%) respondents who had received some kind of RDM services. Data from interview show that respondents received training on the establishment and management of institutional repository as kind of research data management services. This implies that, generally, the subject of RDM services in academic libraries in Zanzibar is still at its infancy stage and therefore it needs special attention and urgent actions. One interesting result was that some library staff perceive their role as only about providing information support rather than technical research support. This might imply the lack of understanding of core function of academic libraries and the role of libraries in RDM services provision among library staff. Moreover, Cox & Pinfield (2014) argue that even though librarians' information management skills may be relevant, it could be challenging translating them to research data contexts (including metadata creation or good data housekeeping).



**Figure 2:** *Awareness, Knowledge and Skills of Information Professionals in Research Data Management*

## 4.2 Institutional Strategies and Initiatives in Place towards Research Data Management Implementation

Respondents were mainly asked questions related to strategies and initiatives in place towards research data management implementation in their libraries. Multiple answers were provided as indicated in Figure 3:



**Figure 3:** *Institutional Strategies and Initiatives in Place towards Research Data Management Implementation*

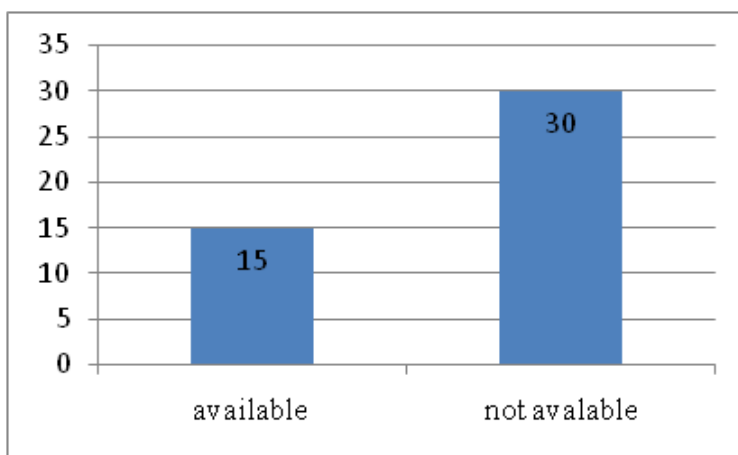
**Source:** *Research Data, 2021*

The results in Figure 3 show that a good number of respondents (40: 88%) indicated that the library provides some kind of RDM services through providing subscriptions to a wide range of electronic database in natural and social sciences, followed by (39.86%) facilitating the use of electronic database through the library network. Moreover, (35.77%) respondents emphasized the library role in providing remote electronic resources service to enable its users to access e-resources off campus, as an initiative in providing RDM services. Furthermore, almost a half of respondents (25.55%) indicated that academic libraries provide access to intellectual works produced by researchers in their institutions including research reports through institutional repository. However, less than a half (20.44%) indicated that library position in providing training for researchers on how to use research data and advice for researchers on scientific resources to support their scientific research was poor, and very few of them (8.15%) indicated that the library consults with faculty members and students about their needs for research data management. Only 5.11% indicated the introduction of research data management course in library academic program. Interestingly, all respondents noted that their libraries did not provide advice for research data sharing, training for researchers on how to access research data and they did not preserve row research data. In general, these data imply that academic libraries in Zanzibar are likely to have introduced some initiatives in supporting research data management through providing access to a wide range of electronic resources and databases through its subscription.

It is true that providing subscriptions to electronic resources and database can be considered

as one of the most important factors that contribute to research development. Likewise, data from interview show that apart from that, respondents claimed to provide research advice on the management of research reports; training researchers on how to use citation systems; training researchers on how to use reference management software; training researchers on how to use data analysis software and advise them on copyright issues. However, it was observed that research data management as defined by Whyte and Tedds (2011) which involves a number of different activities and processes associated with the data lifecycle, involving the design and creation of data, storage, security, preservation, retrieval, sharing and reuse was likely to be limitedly practiced in most of academic libraries in Zanzibar. This implies that there is a need of expanding library’s role to support research. However, according to Auckland (2012) there is evidence that academic faculties often do not engage with the library to the expected level and this might discourage libraries to put more efforts in RDM services.

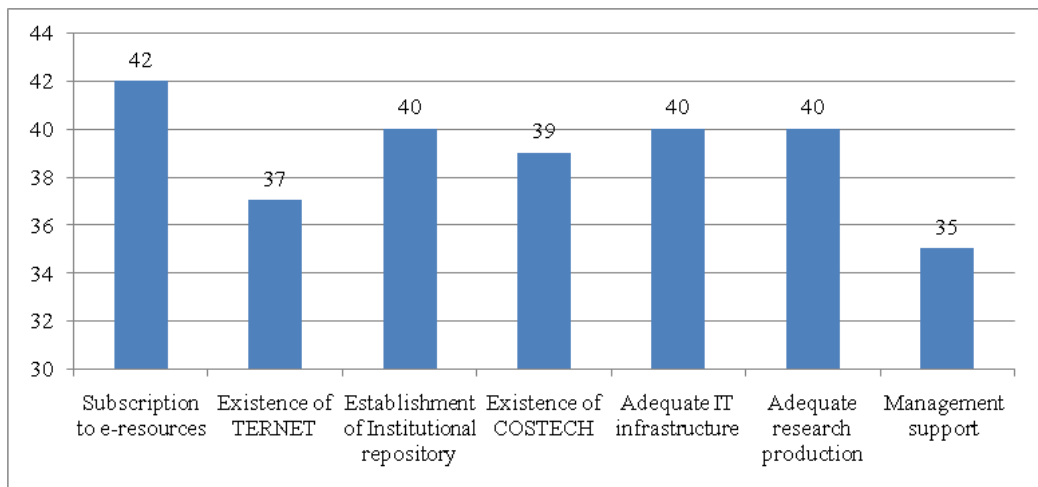
Respondents were also asked on the availability of a policy/guideline regarding research data management in their institution. Their responses provide contradicting picture on the RDM services strategies. As shown in Figure 4, more than a half (30.66%) of the respondents claimed to have neither policy no guideline on RDM while only (15.34%) agreed that there was a policy on RDM. Interestingly, respondents from the same institution had different opinions regarding the issue of policy. In fact, their responses are doubtful and led the researcher to conclude that probably there were no RDM policy in the all selected academic libraries; unless otherwise respondents were confusing between institutional repository policy and research data management services which in fact are two different things though they are somehow related.



**Figure 4:** *Availability of RDM Policy*

**Source:** *Research Data, 2021*

Another question focused on opportunities available for academic libraries in adopting research data management services in Zanzibar. Respondents were asked to rate the given opportunities. Figure 4 summarizes the data.



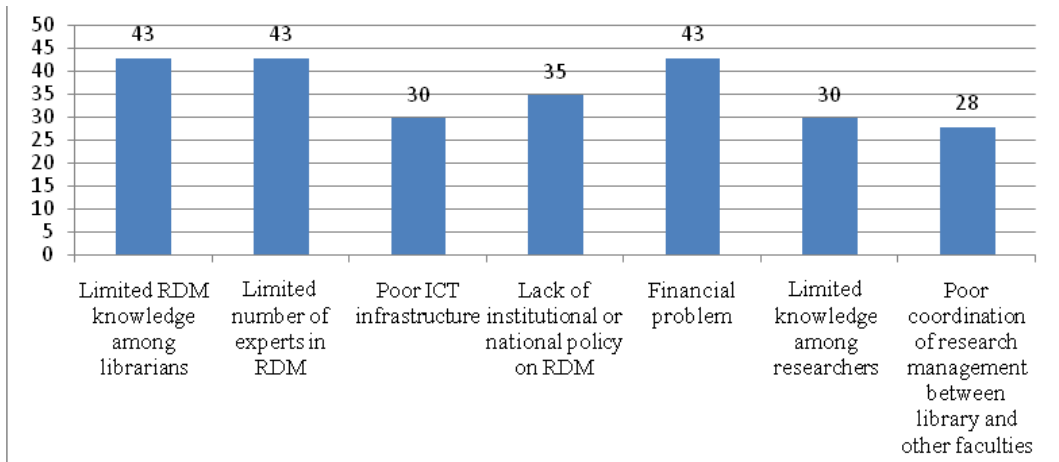
**Figure 5:** *Opportunities Available for Academic Libraries in Adopting RDM Services*

The results in Figure 5 show that a greater part of respondents which is equal to 42.93% out of 45 agreed that subscription of e-resources by the Consortium of Tanzania University and Research Libraries as a great opportunity in the provision of RDM services; followed by 40.88% of the respondents who perceived establishment of institutional repository, adequate ICT infrastructure and adequate research production as crucial opportunities for RDM services. This was followed by 39.86% who mentioned the support provided by the Tanzania Commission for Science and Technology (COSTECH) as significant opportunity towards RDM in Tanzania. Existence of the Tanzania Higher Education and Research Network (TERNET) as well as the establishment of the National Information and Communication Technology Broadband Backbone (NICTBB) was noted as significant opportunities towards RDM services provision in Tanzania by 37.82% respondents. Finally, only 35.77% respondents perceived the support of university administration towards RDM services as a moderate opportunity. Generally, these data imply that there were considerable opportunities from Government as well as Non-governmental organizations towards adoption of research data management services in Zanzibar academic libraries. If these opportunities could be utilized wisely, academic libraries as well as research institutions in the country would be significantly benefited in establishing and maintaining RDM services in the country.

#### **4.3 Challenges Towards Adoption of Research Data Management in Academic Libraries**

The last question focused on finding out the challenges in providing RDM services in Zanzibar academic libraries. Respondents were asked to weigh the level of the expected challenges by selecting the provided 5 scales, where 1 stands for “not a challenge” and 5 for “the most serious challenge”. Figure 6 summarizes the data. Similar responses were provided to limited financial support, limited number of experts and limited staff knowledge and experiences regarding research data management, whereby majority of respondents (43.95%) rated them as the most serious challenges, followed by 35.77% respondents who rated lack of policy and guidelines regarding RDM services as the more serious

challenge. Similarly, a good number of respondents (30.66%) is likely to have the opinion that inadequate ICT facilities to support RDM services and limited knowledge and lack of willingness among researchers to share their research data are somewhat a challenge that might face libraries in providing RDM services. Finally, the data indicate that only 28.62% respondents commented that poor coordination of RDM between library and academics is a less serious challenge. Figure 6 summarizes the data.



**Figure 6:** *Challenges Facing Academic Libraries in the Adoption of RDM*

**Source:** *Research Data, 2021*

Findings in Figure 6 are supported by scholars such as Garritano & Carlson, 2009; Newton, Miller, & Bracke, 2010; Brewerton, 2012; and Auckland, 2012. They point out that inadequate funding to provide research data services is perceived as the main hindrance that hinders libraries to fully implement RDM services. This is also related to inadequate resources for RDM services, including ICT infrastructure, i.e., computers and data repository, and policies to manage digital materials and deal with research data management. Similarly, the study of Patel (2016) addresses the following challenges regarding RDM: copyright and data licensing issues, data security, data privacy and researcher’s mindset. Furthermore, Carlos & Garritano (2010) emphasizes that librarians may not currently have IT technical knowledge, may lack domain-specific expertise and may also have limited personal experience of research, all of which may make it difficult for them to position themselves as key players in this area. Comparing the findings of the current study regarding challenges and the available opportunities, it can be concluded that the available opportunities outweigh the existing challenges and as it has been noted previously that if all RDM stakeholders cooperate and use the available opportunities wisely, the country will achieve notable development in research in general and RDM in particular.

## 5. Conclusion and Recommendations

Research data management has been attracting attention globally. The current study aimed at studying the adoption of research data management services in Zanzibar academic libraries.

The results presented in this cross-sectional study indicated a knowledge gap among information professionals regarding research data management. Interestingly, many of information professionals were confusing about what data management meant, and seemed to associate data management issues with other research topics, such as data analysis and institutional repository. Findings of the current study noted that it is essential to increase awareness of the emerging role of academic libraries staff to support research development. The findings of the current study show that there are some initiatives in place on RDM services such as various research training for researchers and introduction of institutional repositories for preservation of research outputs. Also, there are significant opportunities towards RDM services such as the Government support through the establishment of COSTECH and NICTBB, and the existence of TERNET and COTUL. Finally, lack of knowledge and skills in RDM services was a major concern of library staff, and lack of policy and guidelines and limited financial support to provide research data appeared to be the main obstacle that might hinder libraries implementation of RDM services in academic libraries in Zanzibar. Therefore, this study affirmed the need to train library staff to provide them with technical skills related to RDM and also to develop RDM policies and standards in collaboration with local researcher institutions. Based on the findings of current study, the following recommendations have been provided:

- It is crucial to train library staff on how to provide RDM services and to increase awareness about their role in providing RDM technical services beside their normal informational services.
- Academic libraries should utilize the existing opportunities to enhance RDM services in their institutions.
- In collaboration with other research partners, academic libraries should develop policy, guidelines and strategies for serious implementation of RDM services.
- University and library schools should figure out a way of embedding the RDM topic in their curriculum or providing short trainings on RDM to librarians as well as researchers. This will help to keep them aware and impart knowledge and skills of RDM to them.

## References

- Antell, K., et al. (2014). Dealing with Data: Science Librarians' Participation in Data Management at Association of Research Libraries Institutions. *College & Research Libraries*, 75(4), 557–574. doi:10.5860/crl.75.4.557.
- Auckland, M. (2012). Re-skilling for Research: An Investigation into the Role and Skills of Subject and Liaison Librarians Required to Effectively Support the Evolving Information Needs of Researchers. *Research Libraries UK*, 4. Retrieved from: <https://www.rluk.ac.uk/wp-content/uploads/2014/02/RLUK-Re-skilling.pdf>.
- Bloom, T. (2013). "Data Access for the Open Access Literature: PloS's Data Policy". Available at: <http://www.plos.org/data-access-for-the-open-access-literature-ploss-data-policy/> accessed 24/6/2016.

- Borgman, C. L. (2012). The Conundrum of Sharing Research Data. *Journal of the American Society for Information Science and Technology*, 63(6), 1059–1078. doi:10.1002/asi.22634.
- Brewerton, A. (2012). Re-skilling for Research: Investigating the Needs of Researchers and How Library Staff Can Best Support Them. *New Review of Academic Librarianship*, 18(1), 96–110. doi:10.1080/13614533.2012.665718.
- Brochu, L., & Burns, J. (2019). Librarians and Research Data Management – A Literature Review: Commentary from a Senior Professional and a New Professional Librarian. *New Review of Academic Librarianship*, 25(1), 49–58. doi:10.1080/13614533.2018.1501715.
- Brown, R. A., Wolski, M., & Richardson, J. (2015). Developing New Skills for Research Support Librarians. *The Australian Library Journal*, 64(3), 224–234. doi:10.1080/00049670.2015.1041215.
- Carlson, J., & Kneale, R. (2011). Embedded Librarianship in the Research Context: Navigating New Waters. *College & Research Libraries News*, 72(3), 167–170. doi:10.5860/crln.72.3.8530.
- Chen, H. L., et al. (2015). Library Assessment and Data Analytics in the Big Data Era: Practice and Policies. In Proceedings of the 78th ASIS&T Annual Meeting: Information Science with Impact: Research in and for the Community, St. Louis, Missouri — November 06 - 10, 2015 (p. 2). American Society for Information Science, Silver Springs, MD, USA.
- Childs, S., McLeod, J., Lomas, E. & Cook, G. (2014) “Opening research data: issues and opportunities”. *Records Management Journal*, Vol. 24 Iss: 2, pp.142 – 162.
- Corrall, S. (2014). Designing Libraries for Research Collaboration in the Network World: An Exploratory Study. *Liber Quarterly*, 24(1), 17–48. doi:10.18352/lq.9525.
- Corrall, S., Kennan, M. A., & Afzal, W. (2013). Bibliometrics and Research Data Management Services: Emerging Trends in Library Support for Research. *Library Trends*, 61(3), 636–674. doi:10.1353/lib.2013.0005.
- Covert-Vail, L., & Collard, S. (2012). New roles for new times: Research library services for graduate students. Washington, DC: Association of Research Libraries. Retrieved April 30, 2014, from <http://www.arl.org/storage/documents/publications/nrnt-grad-roles-20dec12.pdf>.
- Cox, A. M., & Pinfield, S. (2014). Research Data Management and Libraries: Current Activities and Future Priorities. *Journal of Librarianship and Information Science*, 46(4), 299–316. doi:10.1177/0961000613492542
- Cox, A. M., & Verbaan, E. (2016). How Academic Librarians, IT Staff, and Research Administrators Perceive and Relate to Research. *Library & Information Science Research*, 38(4), 319–326. doi:10.1016/j.lisr.2016.11.004.
- Cox, A. M., Kennan, M. A., Lyon, L., & Pinfield, S. (2017). Developments in Research Data



Management in Academic Libraries: Towards an Understanding of Research Data Service Maturity. *Journal of the Association for Information Science and Technology*, 68(9), 2182–2200. doi:10.1002/asi.23781.

- Dulle, F. W., Minish-Majanja, M. K., & Cloete, L. M. (2010). Factors Influencing the Adoption of Open Access Scholarly Communication in Tanzanian Public Universities. World Library and Information Congress: 76th IFLA General Conference and Assembly. Gothenburg, Sweden. Retrieved from the International Federation of Library Associations website: <http://www.ifla.org/files/hq/papers/ifla76/138-dulle-en.pdf> accessed 24/6/2016.
- Eindhoven University of Technology. (2020). What is Research Data Management. Available from: <https://www.tue.nl/en/our-university/library/support-by-the-tue-library/scientific-publishing/data-coach/general-terms-and-background/what-is-research-data-management/>
- Federer, L. (2016). Research Data Management in the Age of Big Data: Roles and Opportunities for Librarians. *Information Services & Use*, 36(1-2), 35–43. doi:10.3233/ISU-160797.
- Fonseca, A. J., & Viator, V. P. (2009). Escaping the Island of Lost Faculty: Collaboration as a Means of Visibility. *Collaborative Librarianship*, 1(3), 81. doi:10.29087/2009.1.3.04 NEW Review Of Academic Librarianship 19.
- Garritano, J. R., & Carlson, J. R. (2009). A Subject Librarian's Guide to Collaborating on e-Science projects. *Issues in Science and Technology Librarianship*, No 57 (Spring 2009). Available from: <http://www.istl.org/09-spring/refereed2.html>.
- Giarlo, M. J. (2013). Academic Libraries as Data Quality Hubs. *Journal of Librarianship & Scholarly Communication*, 1(3), 1–10.
- Hamad, F., et al. (2017). Research Data Services in European Academic Research Libraries. *Liber Quarterly*, 27(1), 23–44. doi:10.18352/lq.10180.
- Heidorn, P. B. (2011). The Emerging Role of Libraries in Data Curation and e-Science. *Journal of Library Administration*, 51(7-8), 662–672. doi:10.1080/01930826.2011.601269.
- Koltay, T. (2017). Data Literacy for Researchers and Data Librarians. *Journal of Librarianship and Information Science*, 49(1), 3–14. doi:10.1177/0961000615616450.
- Larsen, S., & Riis, C. (2012). Aarhus University Library: Restructuring a university's library organisation. *Bibliothek Forschung und Praxis*, 36(2), 235–240. doi:10.1515/bfp-2012-0030.
- Latham, B. (2017). Research Data Management: Defining Roles, Prioritizing Services, and Enumerating Challenges. *The Journal of Academic Librarianship*, 43(3), 263–265. doi:10.1016/j.acalib.2017.04.004.
- Lwoga E. T. & Questier, F. (2014). "Faculty Adoption and Usage Behaviour of Open Access Scholarly Communication in Health Science Universities". *New Library World*,

- Lyon, L. (2012). The Informatics Transform: Re-engineering Libraries for the Data Decade. *International Journal of Digital Curation*, 7(1), 126–138. doi:10.2218/ijdc.v7i1.220.
- MacColl, J. (2010). Library Roles in University Research Assessment. *Liber Quarterly*, 20(2), 152–168. doi:10.18352/lq.7984 MacColl, J., & Jubb, M. (2011). Supporting Research: Environments, Administration and Libraries. Dublin, OH: OCLC Online Computer Library Center, Inc.
- Mgonzo, W. J., & Yonah, Z. O. (2014). A Review of Open Access Publication in Tanzania. *International Journal Of Engineering And Computer Science*, 3(9), 8159-8165. Available at <http://www.ijecs.in/issue/v3-i9/38%20ijecs.pdf> accessed 27/6/2016.
- National Institutes of Health (NIH). (2003). NIH Data Sharing Policy and Implementation Guidance. Retrieved on April 30, 2019 from: [http://grants.nih.gov/grants/policy/data\\_sharing](http://grants.nih.gov/grants/policy/data_sharing).
- Newton, M. P., Miller, C. C., & Bracke, M. S. (2010). Librarian Roles in Institutional Repository Data Set Collecting: Outcomes of a Research Library Task Force. *Collection Management*, 36(1), 53–67. doi:10.1080/01462679.2011.530546.
- O'Brien, L., & Richardson, J. (2015). Supporting Research through Partnership. Partnerships and New Roles in the 21st-Century Academic Library: Collaborating, Embedding, and Cross Training for the Future, 191–212.
- Patel, D. (2016). “Research Data Management: a Conceptual Framework”. *Library Review*, Vol. 65 Iss 4/5 pp.
- Pinfield, S., Cox, A. M., & Smith, J. (2014). Research Data Management and Libraries: Relationships, Activities, Drivers and Influences. *PLoS One*, 9(12), e114734. doi:10.1371/journal.pone.0114734.
- Posner, M. (2013). No Half Measures: Overcoming Common Challenges to Doing Digital Humanities in the Library. *Journal of Library Administration*, 53(1), 43–52. doi:10.1080/01930826.2013.756694.
- Tenopir, C., Birch, B., & Allard, S. (2012). Academic Libraries and Research Data Services. Current Practices and Plans for the Future. Chicago, IL: Association of College and Research Libraries. doi:10.1002/pr2.2016.14505301129.
- Tenopir, C., et al. (2014). Research Data Management Services in Academic Research Libraries and Perceptions of Librarians. *Library & Information Science Research*, 36(2), 84–90. doi:10.1016/j.lisr.2013.11.003 20 .
- Tripathi, M. & Shukla, A. & Sonkar, S. K. (2017). Research Data Management Practices in University libraries: A study. *DESIDOC Journal of Library and Information Technology*. 37. 417-424. 10.14429/djlit.37.6.11336.